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Multi-proxy record of past environmental changes from a tropical peatland (Kyambangunguru, Tanzania)

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Tropics play a key role in the atmospheric circulation, partly responsible for the variations of climatic conditions, as they are a major source of heat and water vapour on Earth. Thus, improving our knowledge on past temperature fluctuations and hydrological regimes in these areas may allow to better constrain the driving forces controlling climate system. Peatlands are important archives for the reconstruction of past environmental changes because of their high rates of peat accumulation due to the low rate of plant litter decomposition. The aim of this study was to reconstruct past environmental changes via the high-resolution analysis of several proxy/climate indicators along a 4 m peat core collected in SW Tanzania and covering the last 4,000 years (based on 14C dating).

The core was collected at Kyambangunguru (663 m asl) in a Maar lake system having been filled up by ombrotrophic peat. The evolution from a lake to a peat bog is a frequent phenomenon in Maar lakes of this region; however, the potential role of climate in this process remains unclear. In order to track when and why this conversion occurred, a multi-proxy approach involving elemental, molecular (GDGTs, n-alkanes), isotopic (δ^2H) as well as macro- and microscopic (macro-rests, micro-fossils, palynofacies and pollen) analyses was applied along the core collected at the centre of the Kyambangunguru peat bog.

This multi-proxy approach provided us with an opportunity to study climate and vegetation changes along the core. Macro- and Microscopic observations revealed that the ecosystem likely changed from a lake to a peat bog between ca. 2,300 and 1,500 years BP. During this time interval, molecular proxies and elemental analyses showed a major shift, in agreement with the establishment of a mire. The high C/N values indicated a low decomposition of the organic matter while the GDGT derived proxies showed more acidic and warmer climatic conditions. On the other hand, ^{2}H/1H of plant derived n-alkanes, which are linked to 2H/1H of precipitation and hydrological regime, do not exhibit any major shifts at the time of bog formation. This implies that neither the source of precipitation, nor the humidity level of the region underwent significant changes during the last 4,000 yrs. Thus, lake overgrowth with peat-forming macrophytes, rather than changes in local hydrology, was probably the main factor in the transition from a crater lake to a peat bog at the Kyambangunguru site.